EXHIBIT B - CLEAN VERSION

SCAFFOLD COUPLING ELEMENT WITH A SECURE-SITTING HEAD BOLT

BACKGROUND OF THE INVENTION

The invention relates to a scaffold coupling element for tubular scaffold elements featuring two half braces which can be attached around the scaffold element and pivot around a bolt. A closing element tightens the braces and connects them with an additional brace or a pair of braces which hold a second scaffold element. The closing element consists of T-head bolts which are held by bell-shaped projecting parts limiting the pivotal motion of the T-heads. The shaft with the thread and the nut fit into the fork-shaped, free end piece of the corresponding brace which functions as a closing mechanism.

There have been many types of scaffold couplings for decades and every expert knows about their details. Known are scaffold couplings which connect right-angled scaffold elements, in other words which connect tubes that come together in a specific angle. For this purpose, the two coupling parts can be connected with a joint connector so that they can be turned towards each other. Finally, there are parallel fitting half braces which are connected lengthwise and which connect tubes that run vertically towards each other. Tube parts or bungs can be inserted in the connecting area to transmit the necessary pressure. All those scaffold couplings have in common that the closing elements consist of T-head bolts with a long threaded shaft and of a rounded T-head allowing a limited pivotal motion in the surrounding bell, particularly, the projecting parts. For this purpose, the more common and newer versions of T-heads are bulging out on their sides as well as lengthwise and also feature completely round building elements. A nut will be fitted onto the threaded shaft to connect the two half braces effectively while

tightening them around the corresponding tubes or scaffold elements. While tightening the nut, the people assembling the scaffold have to ensure that the nut transmits sufficient tightening pressure in order to effectively connect the scaffold elements. Experience showed that it cannot always be avoided that the end piece of the T-head bolt which forms the actual T-head can be slightly moved, turned or jammed inside the corresponding bell due to the tightening pressure of the nut. This movement or jamming can lead to the abrupt movement and loosening of the T-head when it suddenly slips back into the originally intended correct longitudinal position even when the repositioning itself is very minor. This can for example happen when sudden pressure is applied to the scaffold coupling or to the entire scaffold. Until now, it was believed that the cause for the crash of large scaffolds measuring more than 100 meters in height was related to nuts that weren't tightened enough and therefore caused loosening. The slight movement or turning motion of the T-head, however, can't be detected even if the assembly is conducted very carefully and thoroughly because the bells holding the T-heads in the projecting parts are located on the opposite side of the scaffold and are not visible during assembly.

SUMMARY OF THE INVENTION

The task of the invention is therefore to create scaffold coupling elements with a secure-sitting head bolt.

The task is solved by the inventor by designing the T-head of the T-head bolts to fit the bell of the projecting parts and by adding contact surfaces to avoid jamming inside the bell or turning during the tightening of the bracing elements while allowing a pivotal motion.

Due to the shape of the T-head, the T-head sits securely in the bell after inserting the shaft into the shaped opening of the bell. This ensures that the T-head cannot move within the

bell when the nut is screwed on and tightened. For this reason, there are shaped contact surfaces designed to prevent a turning or jamming of the T-head. The T-head inserts into the bell in such a way that it cannot be moved when the nut is tightened while allowing the T-head or particularly the T-head bolt to be moved while inside the bell so that the nut can easily glide into the fork of the other half brace. Probably the easier way to ensure the absolute secure sitting position of the T-head bolt in the bell of the projecting parts is to shape the T-head bolts or the actual T-heads to fit the shape of the bell. There is also the option to change the shape of the bell and to leave the T-heads unchanged. It is also possible, that the T-heads and the bells both are shaped to correspond to each other, however, this adds additional cost to change the from of the bell as well as of the T-head. An important focus of the submitted invention is to prevent any possible turning or jamming of the T-head bolts inside the bell by fitting both parts in such a way that after insertion in the bell the T-head can only be moved by turning the T-head bolt but that it otherwise sits absolutely secure.

According to an effective design of the invention it is intended that the T-head is shaped like a wedge and that fits the bell and also includes shaped parts, shown in the figures as parts 20, 21, with specially shaped contact surfaces, shown in the figures as surfaces 27, 28, and that the shaft also includes contact surfaces which together avoid a turning motion inside the bell. The shaped parts and the corresponding contact surfaces attach to the surfaces after insertion in such a way that the T-head bolt can be purposefully moved in the specially shaped opening of the bell, shown in the figures as part 26, to allow it to fit over a scaffold element, in other words, a tube, in a safe manner. However, a movement of the T-head bolt within the bell that would be perpendicular to this purposeful movement will be avoided. Thus, the tightening of the nut will always ensure that the T-head bolt sits securely in the bell and cannot be loosened through

forceful blows or other sudden movements. In the contrary, a specific shape of the T-head of the T-head bolts would still contribute to a connection even in the case of an unfortunate incident, meaning an insufficient tightening of the nut so that a fixation of the scaffold element would be achieved. The specially shaped contact surfaces on the shaft also ensure the precise fit of the T-head bolts in the bell without hindering or compromising the pivotal motion.

An especially advantageous shape of the contact surfaces to ensure the secure position of the T-head in the bell would fit the shaped parts to correspond to the free ends of the T-head or to shape those ends. As previously explained, the T-head is the upper end of the T-head bolt which connects with the thread and which is shaped like a T so that there are the so-called free ends of the T-head on the left and right side of the shaft. Those ends of the T-heads have contact surfaces, flat surfaces, while the ends of the commonly known T-heads are rounded. Due to this round shape, the T-heads cannot sit tightly in the bell which however is possible with the aforementioned flat surfaces. Contrary to up-to-date understanding of the matter the T-head bolt can be pivoted back and forth in the corresponding specially shaped opening in spite of the flat contact surfaces and thus make it possible fit over a tubular element.

Further security of the T-head, particularly, the T-head bolt in the bell of the projecting parts can be accomplished by beveling the free ends of the T-head towards the shaft to form a flat surface. Thus, the T-head, particularly, the entire T-head bolt is pulled into the bell so that the T-bolt and hence the T-head bolt are prevented from jamming when the nut is added and tightened.

Another optimization of the T-head is accomplished by the fact that the free ends of the T-head feature a short bevel at the back of the T pointing away from the shaft, then a short vertical bevel and finally a longitudinal bevel pointing towards the shaft. Particularly, the last

mentioned longitudinal bevel supports a secure fit in the bell because the free ends of the T-head are now also shaped to fit the special form of the bell, particularly, its limiting walls.

Additional insurance against a jamming or turning of the T-head bolt can be accomplished when the shaft is shaped to feature contact surfaces where it attaches to the head. This shaft, which connects with the lower end, particularly, the edges of the specially shaped opening, prevents a twisting and movement of the T-head bolt within the bell. A specified location and fit of the T-head in the bell make it possible that the nut can be screwed on and tightened without enabling the T-head to move and loosen the set position and tightened fit of the scaffold coupling element.

Previously, it was explained that the free ends of the T-head feature vertical contact surfaces. Additionally, it is intended that the shaft includes corresponding contact surfaces as well, so that the shaft in its base includes vertical contact surfaces such as the free ends of the T-head. The contact surfaces would be located vertically towards the longitudinal extension of the T-head.

Also to support an even and quasi controlled insertion of the T-head into the bell, the contact surfaces have limiting edges that are specially formed as bevels to become wider towards the thread. These special edges facilitate the pivotal motion of the T-head bolt in the specified direction, meaning around the longitudinal axis of the T-head.

A preferred embodiment has contact surfaces at the free ends of the T-head and at the base of the shaft that are specially shaped. The fact that the securing contact surfaces relate to the actual T-head as well as the base, meaning the shaft, ensures that the secure fit of the T-head bolt is taken care of in two independent areas so that even under unfortunate circumstances a

secure fit of the T-head bolts can be guaranteed. This means, that an especially secure-sitting T-head bolt has been designed.

The contact surface at the base ensures a secure measure against turning because it prevents any turning motion of the T-head bolt in the specially shaped opening. An additional safety measure can be achieved by the fact that the contact surfaces in the base of the shaft reach all the way to the fork-shaped free end piece of the closing mechanism when completely inserted. The T-head bolt or particularly its shaft will be secured in the area of the specially shaped opening thus in the end zone of the bell as well as in the closing mechanism so that even when maximum pressure is applied a turning movement and a jamming of the T-head bolt would be impossible.

The still necessary pivotal movement of the T-head bolt in the bell, among other actions necessary to insert the shaft in the fork-shaped free end piece of the clamping mechanism, can be guaranteed even with the aforementioned shaping of the contact surfaces because the invention intends for the free end pieces of the T-heads to have slightly flattened supporting surfaces on the side facing the bell. Those slightly flattened supporting surfaces touch the ground or the bottom of the bell which is also slightly flattened at this point so that an exact fit of the T-head can be guaranteed. The necessary pivotal movement of the T-head bolt is therefore possible. Due to the flattened supporting surfaces on both sides, the T-head bolt always slips back into its initial position after the pivotal movement is completed. It does this in such a way, that the corresponding contact surfaces together with the corresponding contact surfaces of the bell guarantee a secure fit of the T-head bolt.

With the correct fit of the T-head bolt and especially of its T-head one addresses the fact that a large number of scaffold coupling elements are currently in use for which any changes

would result in considerable expenditures. Because the invention only calls for a change of the T-head bolts, which need replacing at regular intervals regardless, the security benefits outweigh the minimal costs. It would be of a special advantage if according to the invention the free end pieces of the T-heads on one hand and the bell of the projecting parts on the other hand would be shaped to correspond to each other and preferably feature corresponding contact and supporting surfaces. According to the invention, the specially shaped features are not only implemented on the T-head but also on the bell, therefore both pieces, which naturally would ensure an even higher level of security. Basically, the aforementioned changes on the T-head bolts suffice because they add sufficient security, however, the above referenced solution would be an optimization.

The insertion of the end pieces of the T-head or the entire T-head into the bell according to the invention will be further facilitated by giving the end pieces of the T-head a glide enhancing coating, preferably in the area of the contact and support surfaces. This can be done during the insertion or by adding a coating to the T-heads, particularly, the ends of the T-heads which support the tight position within the bell but also allow for the option to push the T-head bolts out of the bell when necessary. Actually, it is sufficient if the contact and support surfaces or even only the contact surfaces have a special coating whereas the same effect can be reached if the bell is equipped with corresponding contact surfaces so that a T-head made of hard material can position itself tightly inside.

An especially simple design for an insertion-friendly T-head is to manufacture the ends of the T-head or the entire T-head bolt from a softer material than the material of the half braces. It is conceivable to not use the normally intended galvanized zinc on the corresponding contact

surfaces or the ends of the T-heads. Admittedly, this can lead to wear and tear in this area but with a sufficient form and size of the contact surfaces this is no reason to anticipate damage.

Depending on the shape of the bell or the entire scaffold coupling it is possible that the T-head does not slide far enough into the bell. Even though it sits securely due to the invented design and it cannot jam, one cannot rule out the possibility that the scaffold element rests on the back of the T-heads and cannot be correctly tightened. In order to avoid that, the design calls for an indentation on the back of the T-head which is set to correspond with the enclosed scaffold element thus especially with the tube. Even under such unfortunate circumstances, a secure position of the scaffold element on the back of the T-head can be ensured. It is guaranteed that the scaffold element always sits securely in the coupling.

Especially for the backside of the bell it is functional to add an additional contact surface similar to the contact surface which however expands in a V-shape in the area of the shaft up to the middle of the T-head. This also leaves the pivotal motion unaffected where as a dangerous jamming of the T-head inside the bell can be prevented.

As previously pointed out, there is the possibility to alter the bell of the projecting parts to correspond with the T-heads. Accordingly, the invention allows for an additional functionality so that the bell of the projecting parts in its lowest point is fit for the T-head and equipped with contact surfaces to that a turning or jamming of the T-head bolt during the tightening of the bracing element can be prevented. At the same time, the form of the bell shall ensure that the T-head bolt can still easily be inserted and pivoted as necessary while not being able to jam. Thus, an even securer fit at the time of the tightening of the bracing elements in the bell, particularly, at the lowest point in the bell can be guaranteed.

It is especially useful if the contact and support surfaces are shaped to enclose the ends of the T-head and the arched surfaces in between. Similar as with the fit of the T-head bolt to the shape of the bell, it is envisioned here inversely that the entire T-head is securely positioned in the lowest point of the bell through a corresponding fit all around while one has to ensure that a pivotal movement around the longitudinal axis of the bolt is possible in order to insert the bracing element. Due to the contact surfaces a turning motion around the longitudinal axis of the T-head will be prevented.

Another useful design intends for the bell to feature contact surfaces just shortly prior to the lowest point in the bell while the corresponding base relates to the thickness of the T-head. Here, the invention intends for the bell to be wide enough to facilitate the insertion of the T-head bolt or the bracing elements. Only with or shortly before reaching the lowest point of the bell, the T-head would be enclosed by the special shape of the bell. This ensures security to prevent turning, particularly, jamming.

The special characteristics of this invention are the design of a scaffold coupling element that is safe when shaken, particularly, that includes secure-sitting head bolts so that work under difficult conditions is possible without the necessity to check the exact fit of each individual T-head bolt. Moreover, the T-heads feature shapes and contact surfaces which correspond with the bell inside the projecting parts of the appropriate half brace so that adding the nut prevents a damaging turning or jamming of the T-head within the bell. It is not only intended for the ends of the T-heads to feature contact surfaces but also at the base of the shaft, that is in the area where the thread starts so that the shaft rests on the specially formed opening and appropriately also on the fork-shaped end pieces so that a turning or jamming of the T-head can be ruled out. The necessary time, energy and expense to accommodate the changes of the T-head bolts in

relation to the immensely improved security is extremely low especially since there are no changes necessary on the existing scaffold coupling elements. Moreover, during the anyway necessary exchange of the T-head bolts one only has to exchange the old version against the new. The level of safety that can be reached with those T-head bolts manufactured according to the new design is higher by a multitude, so that even blows and other pressures under unfavorable conditions cannot influence the tightness of the T-head bolt. It is always securely positioned inside the bell so that even for example strain through shaking motion in the area of train tracks or similar problems will not cause any problems with such scaffolds. In addition to specially shaping the T-head there is also the option to shape the bell of the projecting parts according to the form of the T-head.

Additional details and advantages of the invention can be gathered in the following description of the corresponding drawing which depicts a preferable design example with the necessary details and individual parts. You will see on:

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 a scaffold coupling element with half braces that hold a scaffold element on one side with an open half brace closing mechanism,

Fig. 2 a T-head bolt in side view,

Fig. 3 a front view onto the projecting parts with bell,

Fig. 4 another version of a scaffold coupling element with tilted T-head bolt,

Fig. 5 a T-head bolt with shapes designed for the present invention,

Fig. 6 a T-head bolt with tilted T-head,

Fig. 7 a scaffold coupling element, cut in the area of the bell and with an inserted T-head

featuring specially shaped contact surfaces and a special indentation in the area of the back of the T,

Fig. 8 a correspondingly shaped T-head bolt in side view,

Fig. 9 an enlarged T-head with specially shaped bevels and the indentation on the area of the back of the T,

Fig. 10 the T-head bolt in side view with front view of the T-head,

Fig. 11 a front view of the T-head with appropriate indentation,

Fig. 12 a side view of the scaffold coupling element with specially shaped bell,

Fig. 13 a perspective depiction of the scaffold element which particularly shows and clarifies the shape of the bell.

DETAILED DESCRIPTION

Fig. 1 shows a scaffold coupling element 1 as partially tightened or braced. The scaffold coupling element 1 is shown in an open position. Such scaffold coupling elements 1 are used to effectively connect scaffold elements that are positioned at an angle towards each other, in particular, to attach them to one another. Half braces 3, 4 are connected with each other and can be moved in a pivotal motion around a bolt 5 whereas on the side opposite of the bolt there is a bracing element 6 to firmly attach a the scaffold element 2 after it has been inserted.

There is another half brace 7 which is connected with the half brace 4 so that it can also support a pivotal motion. This half brace is also called a closing mechanism 8 which encloses the scaffold element, which is not shown in this picture, into this composite. The function of a bracing element 6 according to the drawing on Figure 1 is taken by a T-head 12 which allows the

T-head bolt 10 a sufficient pivotal movement so that the corresponding scaffold element 2 can be inserted in the remaining or purposefully opened inlet when the half brace 3 is opened.

After loosely inserting the scaffold element 2 the half brace 3 is moved around the bolt 5 towards the half brace 4 and the T-head bolt 10 is moved in a pivotal motion so that the shaft 13 with the thread 14 and the nut 15 can be inserted in the fork-shaped end piece 16 of the half brace 3. The nut 15 is then screwed on so that it moves on the thread 14 and touches the corresponding surfaces of the fork-shaped end piece 16 of the closing mechanism 8. Thus, the scaffold element 2 is tightly enclosed without the necessity of any adjustment or something of that nature because, as detailed later, the T-head 12 sits effectively secure in the bell 26.

This secure fit of the T-head 12 in the bell 26 is possible because the T-head 12 includes shaped parts 20, 21 at the end pieces 17, 18 of the T-head 12 which ensure a secure fit inside the bell 26 when the T-head 12 is inserted. The area of the back of the T-head 23 also includes shaped parts 22 which make for an arched back of the T 23 which as well ensures optimal stability of the T-head 12 which will be discussed later under the special design of the shaped parts 20, 21.

Figure 2 and later Figure 5 clarify that in addition to the shaped parts 20, 21 there are shaped parts 24 in the area of the shaft 13 specifically at the base 29 on both sides. Those shaped parts 24 extend over the sides 31 of the specially shaped inlet 25, shown in Figure 3, so that the shaft 13 and therefore the T-head bolt in its entirety can no longer be turned or moved therefore preventing a jamming or slipping of the T-head inside the bell.

The shaped parts 20, 21 and also 24 feature even contact surfaces 27, 28, as shown in Figure 2, which ensure the secure fit of the T-head 12, particularly, the shaft 13, so a crooked insertion of the T-head 12 or jamming can be effectively avoided.

In addition to the contact surface 28 there is another even contact surface 30, shown in Figure 2, at the base so that the shaft 13 at its base has a square or rectangular shape.

Figure 2 shows a T-head bolt 10 with the contact surfaces 27, 28 as well as 30. It is also clearly visible that the contact surface 27 or the shapes 20, 21 are shaped so that they form a bevel towards the shaft 13. Thus, it is ensured that the T-head 12 sits securely inside the bell 26 when the T-head bolt 10 is inserted in the bell 26 and the specially shaped inlet 25.

This special feature is clarified in Figure 3 where the beveled surfaces that correspond with the contact surfaces 27 are labeled with 34 and 35. Here, one can also see the specially shaped inlet 25 which is used to guide in the shaft 13 with the thread 14 while on the bottom of the bell 26 or on the ground of the bell 26 a supporting surface 33 is visible which corresponds to the supporting surface 32 of the end pieces of the T-head 17, 18. When inserting or pulling in the T-head 12 into the bell 26, the supporting surface 32 will rest on the supporting surface 33 so that the person assembling the scaffold elements can identify the optimal position. The T-head bolt can be pivoted back into after the scaffold element 2 has been inserted. Now, the nut 15 can be screwed onto the thread 14 so that the scaffold element can be tightened.

Figures 4 and 5 show a scaffold coupling which in principal follows the description in Figures ~~figure~~ 1 through 3, except that here, a slanted sitting T-head bolt 10 is being used because the half brace 3 is shorter than on the version according to Figure 1.

In addition, Figure 5 shows the shaped parts 20, 21 as well as 22 and 24, used with the T-head bolt 10, which in turn create the desired contact surfaces 27, 28, thus, ensuring a secure fit of the T-head bolt inside the bell 26.

Figure 6 shows a scaffold coupling 1 used to connect two scaffold elements 2, 2' that come together in an angle. One can see that one of the two used T-head bolts 10 includes a T-

head 12 that sits slanted in the bell 26 and therefore is able to slip in the correct position as a result of shaking or a sudden blow, which then would no longer ensure a safe fixation of the scaffold element 2'. The T-head bolt 10 includes a T-head 12 with rounded end pieces 17, 18. Theses rounded end pieces of the T-head 17, 18 are advantageous in the pivotal motion of the T-head bolt 10 inside the bell 26, however, they can lead to a dangerous position of the T-head 12 as shown in Figure 6.

Figure 7 shows a scaffold coupling element 1 which is closed around a scaffold element 2 with both upper half braces 3 and 4. This is accomplished with the aid of the partially visible T-head bolt 10 where the nut 15 with the base 19 has already been tightened.

The additional half brace 7 is set so that one can see the position of the T-head 12 in the bell 26 at the cross-section of the projecting part 11'. The T-head 12 in this version includes quasi layered contact surfaces 27, as shown in Figures 7, 8, 9 and 11. The contact surfaces 28 in the area of the shaft 13 are also especially insertion friendly in their shape since the corresponding edges are beveled. This can be seen especially in Figure 9.

The back of the T-head 23 includes an indentation 48 to facilitate the insertion of the scaffold element 2 and also to enable the insertion of the T-head 12 when it cannot be inserted far enough into the bell. The indentation 48 corresponds with the outer side of the scaffold element 2 so that the scaffold element 2 or the corresponding tube can also rest on the T-head 12.

Figure 8 shows a T-head bolt 10 where the indentation 48 in the area of the back of the T and the quasi layered contact surfaces 27 are visible.

This special shape of the contact surfaces 27, particularly, the end pieces of the T-head 17 and 18 are clearly visible on Figure 9, where you can clearly see that the first is a bevel 38 in the direction of the back of the T 23 which becomes a short vertical 39 and connects into a

longitudinal bevel 40 so that the safe and tight position of the T-head 12 in the bell 26 can be achieved as previously mentioned at multiple times. In addition, the edges 42, 43 in the area of the shaft 13 or at the base of the shaft 13 are beveled 44, 45 and extend out towards the shaft 13. This forms a type of wedge that facilitates an exact insertion and tightening of the T-head 12 in the bell 26.

Figure 10 shows the shape of the bevel 38, the vertical 39 and the longitudinal bevel 40 in the area of the end pieces of the T 17, 18 which facilitates the insertion into the bell 26 through the previously mentioned bevels 44, 45, 45', particularly, the edges 42, 43, 43'.

Figure 11 is a view of the back of the T 23 of the T-head 12 where the hollow-like indentation 48 is visible as well as the specially shaped parts of the bevels 38 at the end pieces of the T 17 and 18. In addition, you can see the leveled pieces 47 along the edges of the T-head 12 that allow for an optimal shape for inserting and tightening the T-head 12.

Figures 12 and 13 clarify a version of the scaffold element where the bell 26 in the projecting parts 11 is fit to correspond to the shape of the T-head 12. In the side view of the scaffold coupling 1 one can see the bell 26 and the lowest point of the bell which is especially shaped to fit the T-head 12 with its contact surfaces 27'. Since the continuation of the lowest point in the bell, which is open to allow the shaft 13 of the T-head bolt to be inserted, also includes a contact surface 28', the desired fixation of the closing element 6 in the bell 26, particularly, in the projecting parts 11, can be achieved. In addition, the lowest point of the bell 55 is fit to the arched surfaces 56 resulting in specific contact surfaces 32'.

Especially in Figure 13, it is shown that the bell 26 includes part 58 towards its lowest point 55 after which the special fit for the T-head 12 follows, meaning only after this point are

there contact surfaces 27', 32' designed to facilitate the insertion of the T-head bolt, and also to facilitate loosening of the T-head bolt.

All mentioned characteristics, as well as the features shown on the drawings are either by themselves or in combination essential to this invention.